GEORGIA
DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION DIVISION

Richard E. Dunn, Director

Air Protection Branch
4244 International Parkway
Suite 120
Atlanta, Georgia 30354
404-363-7000

NARRATIVE

TO: Jeng-Hon Su

FROM: Ginger Payment

DATE: April 27, 2022

Facility Name:	**Suniva, Inc.**
AIRS No.:	135-00272
Location:	Norcross, GA (Gwinnett County)
Application #:	28321
Date of Application:	March 2, 2022

Background Information

Suniva, Inc. (hereinafter "facility") previously manufactured high-efficiency monocrystalline silicon photovoltaic (PV) cells and was located at 5775 Peachtree Industrial Blvd. in Norcross, GA (Gwinnett County). A synthetic minor permit, Permit No. 3674-135-0272-S-03-0, was issued on April 4, 2014 for the construction and operation of a planarization wet bench (PLA1) and for the operation of the facility. The permit limited VOC emissions to less than 25 tpy, NOx emissions to less than 25 tpy and HAP emissions to less than 25/10 tpy. Amendment No. 3674-135-0272-S-03-1 was issued on January 6, 2016 for an expansion. An NPR letter was issued on October 14, 2014 for the discontinued use of "Enlight 131" texturizer and use a new texturizer with lower VOC and another NPR letter was issued on April 26, 2016 for the option to not use the optional, additional thermal oxidizers on the new print lines. The permit (and amendment) were revoked on November 29, 2018 as the facility had not paid fees and was deemed to be out of business based on the October 25, 2018 onsite inspection.

The facility is requesting a permit to reopen and to restart the same operations that had previously been conducted.

Suniva uses several process steps to convert mono-crystalline Silicon wafers into high efficiency solar cells. The Silicon wafers are very thin slices of Silicon that are sawn by the wafer supplier from a large block of solid Silicon. Solar cells (also known as "photovoltaic cells") are solid-state electronic devices that produce electricity when exposed to light.

Stack splitters: Raw silicon wafers stacks are split in order to get it arranged for further processing. Wafers that do not meet the process requirements are removed at this stage. No emissions are expected from this process.

Saw damage removal, texturing, and cleaning (WB01, WB02, WB04 through WB11): The wafers are passed through wet benches where surface damages are removed, pyramid structures are formed in the wafers, and the surface is further cleaned with acids.

- Process input chemicals: KOH, Alka-Tex, HF, HCl, O3, H2O2, NaClO
- Expected emissions: HF, HCl, Cl2, VOC

- Controls: Acid scrubbers (WS01, WS04, WS06)

Chemical diffusion in furnaces (DF01 through DF13): The textured and clean wafers are heated in the electrically heated furnace. POCl3 along with nitrogen and oxygen is introduced into the furnace. Phosphorus gets diffused into the wafer forming the emitter layer of the solar cell.

- Process input chemicals: POCl3, O2, N2
- Expected emissions: H3PO4, HCl, Cl2
- Controls: Acid scrubbers (WS02, WS07)

Precision Materials Modification System (PMMS) (PMMS1 through PMMS6): The textured and clean wafers pass through PMMS implanters for boron impregnation.

- Process input chemicals: Phosphine, BF3
- Expected emissions: Phosphine, BF3, HF
- Controls: Scrubbers (DS01 through DS07)

Chemical junction isolation and phosphosilicate glass (PSG) removal (CJP1 through CJP6): Any parasitic phosphoros diffused on the rear side of the cell in the previous stage are removed so that the front and rear sides do not short. Any unwanted PSG is also removed in this stage by etching.
This stage thus causes partial planarization of the solar cell.

- Process input chemicals: KOH, H2O, H2SO4, HNO3, HF, O3
- Expected emissions: HNO3, HF, NOx, O3, SiF4, Trace H2SO4
- Controls: Acid scrubbers (WS03, WS05)

Plasma Enhanced Chemical Vapor Deposition (PECVD) on rear side (BD01 through BD07): Aluminum oxide (Al2O3) and silicon nitride (Si3N4) are deposited on the rear side of the cell forming the dielectric coating layer for increased cell efficiency.

- Process input chemicals: SiH4 (Silane), NH3, O2, N2, trimethyl aluminum (TMA)
- Expected emissions: PM, NH3
- Controls: Wet scrubbers (DAS01-04) with natural gas assist

Plasma Enhanced Chemical Vapor Deposition (PECVD) on front side (CD01 through CD15): Silicon nitride (Si3N4) is deposited on the front side of the cell to form an anti-reflective coating.

- Process input chemicals: SiH4, NH3, N2
- Expected emissions: SiH4, NH3
- Controls: Wet scrubbers (SCD1-15)

Laser ablation: Laser ablation is used to locally remove some portions of the rear dielectric coating. This removal will enable metal (aluminum) to be deposited in these places in the next stage.

- Process input chemicals: None
- Expected emissions: PM (silicon dust)
- Controls: Internal filter

Metal Print Lines (MP01 through MP08): In the print lines, silver (Ag) paste is applied on the rear side for solder pads, aluminum (Al) paste is applied on the rear side for contact links, and Ag paste is applied on the front for contact links. After paste application, the cells pass through an electrically heated fast fire furnace.

- Process input chemicals: Al paste containing organics, Ag paste containing organics

- Expected emissions: VOC, HAP
- Controls: Electrically heated oxidizers (OX01-08)

Testing, inspection, sorting, and packing: The ready solar cells from the metal print lines are passed through current/voltage testing. The passed cells are manually inspected for defects, sorted and then packed for shipping. No emissions are expected from this process.

Purpose of Application

Application No. 28321 was submitted on March 2, 2022 and was received on March 10, 2022 to request the operation of a solar panel manufacturing facility. This would re-startup a previously shutdown solar panel manufacturing facility.

A public advisory (PA0322-3) was issued on March 14, 2022 and will expire on April 15, 2022.

Updated Equipment List

All of the equipment is already located at the facility; however, it has not been operated in several years. The following equipment will be treated as "proposed equipment" in the application.

Emission Units			Associated Control Devices	
Source Code	Description	Installation Date	Source Code	Description
WB01	Wet Bench 1	2008	WS01	KCH Scrubber (acids)
WB02	Wet Bench 2	2009	WS01	KCH Scrubber (acids)
WB04	Wet Bench 4	2011	WS01	KCH Scrubber (acids)
WB05	Wet Bench 5	2016	WS01	KCH Scrubber (acids)
WB06	Wet Bench 6	2016	WS06	Scrubber
WB07	Wet Bench 7	2016	WS06	Scrubber
WB08	Wet Bench 8	2016	WS04	TecHarmonic Scrubber
WB09	Wet Bench 9	2016	WS04	TecHarmonic Scrubber
WB10	Wet Bench 10	2016	WS04	TecHarmonic Scrubber
WB11	Wet Bench 11	2016	WS04	TecHarmonic Scrubber
DF01	Chemical Diffusion Furnace 1	2008	WS02	TecHarmonic Scrubber
DF02	Chemical Diffusion Furnace 2	2009	WS02	TecHarmonic Scrubber
DF03	Chemical Diffusion Furnace 3	2010	WS02	TecHarmonic Scrubber
DF04	Chemical Diffusion Furnace 4	2011	WS02	TecHarmonic Scrubber
DF05	Chemical Diffusion Furnace 5	2016	WS02	TecHarmonic Scrubber
DF06	Chemical Diffusion Furnace 6	2016	WS02	TecHarmonic Scrubber
DF07	Chemical Diffusion Furnace 7	2016	WS02	TecHarmonic Scrubber

Emission Units			Associated Control Devices	
Source Code	**Description**	**Installation Date**	**Source Code**	**Description**
DF08	Chemical Diffusion Furnace 8	2016	WS02	TecHarmonic Scrubber
DF09	Chemical Diffusion Furnace 9	2016	WS07	Scrubber
DF10	Chemical Diffusion Furnace 10	2016	WS07	Scrubber
DF11	Chemical Diffusion Furnace 11	2016	WS07	Scrubber
DF12	Chemical Diffusion Furnace 12	2016	WS07	Scrubber
DF13	Chemical Diffusion Furnace 13	2016	WS07	Scrubber
CJP1	Chemical junction isolation and PSG removal	2016	WS03	Retrofitted KCH Acid Scrubber
CJP2	Chemical junction isolation and PSG removal	2016	WS03	Retrofitted KCH Acid Scrubber
CJP3	Chemical junction isolation and PSG removal	2016	WS03	Retrofitted KCH Acid Scrubber
CJP4	Chemical junction isolation and PSG removal	2016	WS03	Retrofitted KCH Acid Scrubber
CJP5	Chemical junction isolation and PSG removal	2016	WS05	Scrubber
CJP6	Chemical junction isolation and PSG removal	2016	WS05	Scrubber
BD01	Back side Chemical Deposition System 1	2016	DAS01	Scrubber
BD02	Back side Chemical Deposition System 2	2016	DAS01	Scrubber
BD03	Back side Chemical Deposition System 3	2016	DAS02	Scrubber
BD04	Back side Chemical Deposition System 4	2016	DAS02	Scrubber
BD05	Back side Chemical Deposition System 5	2016	DAS03	Scrubber
BD06	Back side Chemical Deposition System 6	2016	DAS03	Scrubber
BD07	Back side Chemical Deposition System 7	2016	DAS04	Scrubber
CD01	Front side Chemical Deposition System 1	2013	SCD1	Scrubber No. 1
CD02	Front side Chemical Deposition System 2	2008	SCD2	Scrubber No. 2
CD03	Front side Chemical Deposition System 3	2010	SCD3	Scrubber No. 3
CD04	Front side Chemical Deposition System 4	2013	SCD4	Scrubber No. 4
CD05	Front side Chemical Deposition System 5	2013	SCD5	Scrubber No. 5
CD06	Front side Chemical Deposition System 6	2016	SCD6	Scrubber No. 6
CD07	Front side Chemical Deposition System 7	2016	SCD7	Scrubber No. 7
CD08	Front side Chemical Deposition System 8	2016	SCD8	Scrubber No. 8
CD09	Front side Chemical Deposition System 9	2016	SCD9	Scrubber No. 9
CD10	Front side Chemical Deposition System 10	2016	SCD10	Scrubber No. 10
CD11	Front side Chemical Deposition System 11	2016	SCD11	Scrubber No. 11
CD12	Front side Chemical Deposition System 12	2016	SCD12	Scrubber No. 12
CD13	Front side Chemical Deposition System 13	2016	SCD13	Scrubber No. 13
CD14	Front side Chemical Deposition System 14	2016	SCD14	Scrubber No. 14

Emission Units			Associated Control Devices	
Source Code	**Description**	**Installation Date**	**Source Code**	**Description**
CD15	Front side Chemical Deposition System 15	2016	SCD15	Scrubber No. 15
LA01	Laser Ablation 1	2016	LS01	Filter Collection
LA02	Laser Ablation 2	2016	LS02	Filter Collection
LA03	Laser Ablation 3	2016	LS03	Filter Collection
LA04	Laser Ablation 4	2016	LS04	Filter Collection
LA05	Laser Ablation 5	2016	LS05	Filter Collection
LA06	Laser Ablation 6	2016	LS06	Filter Collection
LA07	Laser Ablation 7	2016	LS07	Filter Collection
MP01	Metal Paste Application Line 1	2008	OX01	Thermal Oxidizer (electric)
MP02	Metal Paste Application Line 2	2009	OX02	Thermal Oxidizer (electric)
MP03	Metal Paste Application Line 3	2010	OX03	Thermal Oxidizer (electric)
MP04	Metal Paste Application Line 4	2016	OX04	Thermal Oxidizer (electric)
MP05	Metal Paste Application Line 5	2016	OX05	Thermal Oxidizer (electric)
MP06	Metal Paste Application Line 6	2016	OX06	Thermal Oxidizer (electric)
MP07	Metal Paste Application Line 7	2016	OX07	Thermal Oxidizer (electric)
MP08	Metal Paste Application Line 8	2016	OX08	Thermal Oxidizer (electric)
PMMS1	Precision Materials Modification System – Machine 1	2010	DS02 DS03	Novapure Scrubber Novapure Scrubber
PMMS2	Precision Materials Modification System – Machine 2	2011	DS02 DS03	Novapure Scrubber Novapure Scrubber
PMMS3	Precision Materials Modification System – Machine 3	2011	DS04 DS05	Novapure Scrubber Novapure Scrubber
PMMS4	Precision Materials Modification System – Machine 4	2011	DS04 DS05	Novapure Scrubber Novapure Scrubber
PMMS5	Precision Materials Modification System – Machine 5	2011	DS06 DS07	Novapure Scrubber Novapure Scrubber
PMMS6	Precision Materials Modification System – Machine 6	2011	DS06 DS07	Novapure Scrubber Novapure Scrubber
RDCD	R&D Chemical Deposition	2008	DS01	CS Clean Scrubber
RD LPCVD	R&D	2016	DS01	CS Clean Scrubber
RDWB	R&D Wet Bench	2008	WS01	KCH Scrubber (acids)
PSG1	Phosphosilicate Glass Etch 1	2008	WS01	KCH Scrubber (acids)
BC1	Boat Cleaner 1	2016	WS01	KCH Scrubber (acids)
BC2	Boat Cleaner 2	2016	WS01	KCH Scrubber (acids)
BC3	Boat Cleaner 3	2016	WS01	KCH Scrubber (acids)

CONTROL EQUIPMENT INFORMATION

Associated Control Devices ID	Scrubber Description
WS01	Wet Acid Scrubber (packed bed using sodium hydroxide)
WS02	Wet Acid Scrubber (packed tower using RO water)
WS03	Wet Acid Scrubber (packed tower using water)
WS04	Wet Acid Scrubber (packed bed using sodium hydroxide)
WS05	Wet Acid Scrubber (packed tower using water)
WS06	Wet Acid Scrubber (packed bed using sodium hydroxide)
WS07	Wet Acid Scrubber (packed bed using sodium hydroxide)
DAS01 through DAS04	Wet Scrubber (packed bed)
SCD1 through SCD15	Scrubber (packed bed)
LS01 through LS07	Filters
DS01	Dry Bed Scrubber (copper carbonate)
DS02	Dry Bed Scrubber (copper carbonate)
DS03	Dry Bed Scrubber (copper carbonate)
DS04	Dry Bed Scrubber (copper carbonate)
DS05	Dry Bed Scrubber (copper carbonate)
DS06	Dry Bed Scrubber (copper carbonate)
DS07	Dry Bed Scrubber (copper carbonate)
OX01	Thermal Oxidizer
OX02	Thermal Oxidizer
OX03	Thermal Oxidizer
OX04	Thermal Oxidizer
OX05	Thermal Oxidizer
OX06	Thermal Oxidizer
OX07	Thermal Oxidizer
OX08	Thermal Oxidizer

There will be three emergency generators onsite. Emergency generator EG01 is a 900 Hp caterpillar, model C18 with a manufacture date of 2008. Emergency generators EG02 and EG03 are 600 kW and 750 kW emergency generators.

There are also two exempted 1.9 MMBtu/hr natural gas fired, hot water heaters for the facility.

Emissions Summary

Emissions from paste usage are based on the actual amount of paste usage and the VOC/HAP content of the paste. Potential emissions were projected based on a 25% increase from the maximum historical monthly usage. The potential controlled emissions include a control efficiency of 98%.

The process baths of the Wet Benches use a texturizer to prep the wafers. The texturizer is diluted in the wet bench process baths, and the process baths are maintained at 90°C. The VOC composition of 28g/L was tested at this temperature and the results of these tests were reviewed by GAEPD ISMP. Because the emissions were determined at this specific temperature, ISMP recommended an excursion value of 95°C in the process baths during Application No. 22292.

The potential acid emissions from the wet benches were estimated using the mass flow rate based on data from the equipment manufacturer, the maximum operating hours of the benches (8,760 hours/yr) and a projected 95% control efficiency of the scrubbers.

Emissions from the diffusion furnaces are based on engineering estimates that assume that each furnace will emit 104 g/day of HCl and 93g/day of H_3PO_4. These emission factors will be verified with testing required by the permit. The emissions shown in the application did not include a control factor; however, the Diffusion furnaces will be control by an acid scrubber.

Laser ablation assumes an exhaust flowrate of 118 scfm per unit and an exit loading of 0.0057 gr/dscf. The control efficiency of the filter is assumed to be 90%.

The emissions from the precision materials modification system (PMMS) are based on the material usage, the concentration of the HAP in the materials and the control efficiency of the scrubbers.

The front chemical vapor deposition emissions are calculated using the feed rates into the deposition tools with a worst-case scenario assuming no amount of materials are consumed in the reaction. These are controlled by scrubbers with as assumed 99% control efficiency.

The emissions from chemical junction isolation and PSG removal are based on data provided by the manufacturer. Emissions are based on the maximum operating hours of 8,760 hours/yr and include a control efficiency of 95%.

The emergency generator and two water heaters will generate particulate matter emissions, NOx emissions, SO2 emissions and CO emissions. AP-42 emission factors were used to calculate the potential emissions from the two water heaters. The manufacturer emission factors were used for the emergency generators. The maximum hours of operation for the emergency generators were 200 hours, which is the limit by definition.

Wipe-down IPA emissions were based on the maximum historical monthly usage and the VOC content.

The emissions shown in the following table are post-controlled emissions. The permit will include a VOC limit of 25 tpy, a NOx emission limit of 25 tpy and a HAP emission limit of 25/10 tpy because the potential uncontrolled emissions for these pollutants have the potential to exceed minor source limits.

Facility-Wide Emissions
(in tons per year)

Pollutant	Potential Emissions
$PM/PM_{10}/PM_{2.5}$	2.63/2.73/2.73
NOx	<25
SO_2	0.38
CO	2.63
VOC	<25

Pollutant	Potential Emissions
Max. Individual HAP	<10
Total HAP	<25

Regulatory Applicability

In order to avoid Georgia Rule (tt) – *VOC Emissions from Major Sources*, the permit includes a VOC emission limit of 25 tpy.

In order to avoid Georgia Rule (yy) – *Emissions of Nitrogen Oxides from Major Sources*, the permit includes a NOx emission limit of 25 tpy limit.

In order to avoid MACT requirements, HAP emissions are limited to less than 10 tpy for an individual HAP and less than 25 tpy for combined HAP emissions.

The facility will be subject to Georgia Rule (b) – *Visible Emissions* and Georgia Rule (e) – *Particulate Emission from Manufacturing Processes*.

The facility will be subject to Georgia Rule (g) – *Sulfur Dioxide* and will comply with this rule by limiting the fuel used at the facility to natural gas.

The emergency generators are subject to 40CFR60 Subpart IIII – *Standards of Performance for Stationary Compression Ignition Internal Combustion Engines* (CI ICE) and 40 CFR 63 Subpart ZZZZ – *National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines*.

Permit Conditions

- Condition 2.1 limits the VOC emissions from the facility to less than 25 tpy, in order to avoid the VOC reasonably available control technology (RACT) requirements specified in GA Rule (tt).
- Condition 2.2 limits the HAP emissions to less than 10 tpy for an individual HAP emission and less than 25 tpy for combined HAP emissions in order to be an area source for HAP emissions and avoid MACT requirements.
- Condition 2.3 limits the NOx emissions from the facility to less than 25 tpy, in order to avoid the NOx RACT requirements specified in GA Rule (yy).
- Condition 2.4 subjects the facility to Georgia Rule (b).
- Condition 2.5 subjects the facility to Georgia Rule (e).
- Condition 2.6 limits the fuel burning to the combustion of natural gas for all fuel burning sources except the emergency generators in order to satisfy Georgia Rule (g).
- Condition 2.7 subjects the emergency generators to 40 CFR 60 Subpart IIII.
- Condition 2.8 limits the diesel fuel fired in the emergency generator to less 15 ppm sulfur as required by 40 CFR 60 Subpart IIII.
- Condition 2.9 limits the maintenance checks and readiness testing times to less than 100 hours per year per generator subject to 40CFR60 Subpart IIII.
- Condition 2.10 subjects the emergency generators to 40 CFR 63 Subpart ZZZZ.

- Condition 2.11 limits the wafer production to 110% capacity of the load tested during the performance test. This is to ensure that emission factor, in terms of lb/hr, remains a valid determination of the emissions from this part of the production. This limit only applies to the wet benches because the other areas of production will base their emission factor on emissions per cell manufactured.
- Condition 4.1 requires the facility to maintain and inspect the air pollution control equipment and to document any actions taken.
- Condition 4.2 requires all of the control equipment to be operated at all times when the equipment that they control is being operated. The scrubbers are used to control mainly HAP emissions. Scrubbers WS03 and WS05 also help to reduce some NOx emissions. The electric thermal oxidizers (ID Nos. OX01 through OX08) are used to control VOC and HAP emissions. The control devices above help reduce the facility's NOx, VOC, and single/combined HAP emissions below the associated emission caps.
- Condition 4.3 requires a maintenance and inspection plan for the Oxidizers.
- Condition 4.4 requires the facility to operate the thermal oxidizers at or above the minimum temperature established during the most recent performance test (at or above 1,382°F before the initial performance test is conducted) so that the thermal oxidizers would achieve the tested VOC destruction efficiencies.
- Condition 4.5 requires the facility to operate the scrubbers (ID Nos. WS01 through WS07, DAS01 through DAS04, and SCD1 through SCD15) at or above the associated minimum scrubbant flow rates established during the most recent performance tests (at or above the manufacturer recommended level before the initial tests are conducted).
- Condition 4.6 requires the facility to operate Scrubbers WS01 through WS07 within the associated pH range established during the most recent performance tests (within the associated pH range recommended by the scrubber manufacturer before the initial performance tests are conducted).
- Condition 4.7 requires the filters to be operated for the Laser Ablation units and also requires filter changes.
- Condition 5.1 defines the requirements of continuous monitoring systems.
- Condition 5.2 details the monitoring requirements for the control devices.
    - Scrubbers WS01 through WS07 control acid emissions; therefore, the pH and scrubbant flow rate are indicators of these scrubber performance.
    - Scrubbers DAS01 through DAS04 and SCD1 through SCD15 will monitoring only the scrubbant flow rate. Since these scrubbers are used to control NH_3 and SiH_4, which are weak base and weak acid, pH monitoring is not necessary.
    - The filters for the Laser Ablation units will control PM; therefore, the pressure drop across the filters will indicate the control device performance.
    - The thermal oxidizers will control VOC and HAP emissions from the Metal Print Lines. The combustion zone temperatures for the thermal oxidizers will indicate the control device performance.
    - The temperature of the process baths will be monitored to ensure that VOC emissions are not increased as a result of higher temperatures.
- Condition 5.3 requires the facility to conduct weekly visual inspection of the dry scrubbers (DS01, DS02, DS03, DS04, DS05, DS06 and DS07), the alarms and the LED warning indicators to make sure that the equipment is in proper working condition. The dry scrubbers are equipped with an audible alarm and LED warning that indicates when the absorber material is 75% spent. Corrective actions and documentation of any actions are required. They are inherently expected to have control efficiencies greater than 99.9% as per manufacturer and the uncontrolled emissions from the emission units are expected to be <0.6 tons/yr for any pollutant. Based on this, there are no other testing or monitoring requirements for the dry scrubbers.

- Condition 5.4 requires a meter to record the operating hours for the emergency generators as required by 40 CFR 60 Subpart IIII.

In order to demonstrate compliance with the NOx, VOC, and HAP emission caps specified in Conditions 2.1 through 2.3, the facility is required to track actual NOx, VOC, and HAP emissions from the entire facility. Mass balance with additional control efficiencies would only work for the metal paste application lines (ID Nos. MP01 through MP08). All other processes may more or less involve some chemical reactions, so mass balance would not work. Therefore, NOx, VOC, and HAP emission rates (factors) at each scrubber outlet are needed for calculating actual emission rates. The following testing are mostly for after-control emission factors:

- Condition 6.2 requires additional performance tests when production rates increase above the rate at which the control equipment was tested.
- Condition 6.3 requires performance tests for the thermal oxidizers' destruction and removal efficiency (DRE). Because all of the metal paste lines and oxidizers are similar equipment, the facility will be required to test four of the eight oxidizers and use the emission factors and temperature settings for all oxidizers. The remaining four will be tested in five years. The initial four oxidizers tested will be retested five years after the second group is tested. The minimum combustion temperature of 1382°F is based on manufacturer recommended operating temperature of 750°C with a maximum of 850°C; this set point can be used before the initial performance tests are conducted.
- Condition 6.4 requires performance tests for Wet Scrubbers WS01, WS04 and WS06 to determine the VOC, HF, HCl and CL_2 emission rates and to determine the scrubbant pH range and the minimum scrubbant flow rate for each scrubber. Since the test results are in the units of pound per hour, the total combined wafer throughput for each wet bench group controlled by the same scrubber, in units per hour, shall also be recorded during the performance tests; Condition 2.11 limits the wafer production to no more than 110% of the combined wafer throughput.
- Condition 6.5 requires performance tests for Wet Scrubbers WS02 and WS07 to determine the HCl, CL_2 and H_3PO_4 emission rates, in lbs/cell, and to determine the scrubbant pH range and the scrubbant flow rate for each scrubber.
- Condition 6.6 requires performance tests for Wet Scrubbers WS03 and WS05 to determine the HF, HNO_3, NOx, H_2SO_4 and SiF_4 emission rates, in lbs/cell, and to determine the scrubbant pH range and the minimum scrubbant flow rate for each scrubber.
- Condition 6.7 requires performance tests for at least two of Wet Scrubbers DAS01 through DAS03, Wet Scrubber DAS-04 and at least four of Wet Scrubbers SCD1 through SCD15 to determine the Silane and Ammonia emission rates, in lbs/cell, and to determine the minimum scrubbant flow rate for each scrubber. Because Wet Scrubbers DAS01 through DAS03 are similar and controlling similar equipment, two of these three are being required to be tested and will be used as a reference for the other one. Wet Scrubber DAS04 will need to be tested separately because it is controlling a different flow of emissions (only from one emission unit). Wet Scrubbers DAS01 through DAS03 are all controlling two emission units. Because Wet Scrubbers SCD1 through SCD15 are also similar and controlling similar equipment, at least four of these being required to be tested and will be used a references for the others.

For the emission factors in the units of lbs/cell, no throughput records need to be recorded. The hourly emission rate will fluctuate along with the actual throughput.

- Condition 7.1 requires the facility to provide a startup notification.

- Condition 7.2 requires the facility to maintain usage records of materials containing VOCs. This condition also requires keeping records of multiple parameters that will be used in the equations in Conditions 7.3, 7.7, and 7.9 to calculate actual VOC, HAP, and NOx emissions.
- Condition 7.3 provides an equation which will be used in calculating VOC emissions. Scrubbers WS02, WS03, WS05, WS07, DAS01 through DAS04, SCD1 through SCD15, and DS01 through DS07 are not included in the equation because they emit only HAP emissions (not VOC emissions). Thermal Oxidizers' DRE is assumed to be zero percent when either the combustion zone temperature falls below the set point or exhaust bypasses the oxidizers.
- Conditions 7.4 and 7.5 require the monthly VOC records from Condition 7.3 to be used to determine the VOC emissions for each month and each twelve-month consecutive period. The facility is required to notify the Division if the VOC emissions equal to or exceed 2.08 tons during any month or 25 tons during any twelve-month period.
- Condition 7.6 requires the facility to maintain usage records of materials containing HAPs. This condition also requires keeping records of multiple parameters that will be used in the equations in Condition 7.7 to calculate actual HAP emissions.
- Condition 7.7 requires the calculation of HAP emissions from each scrubber and thermal oxidizer. Thermal Oxidizers' DRE is assumed to be zero percent when either the combustion zone temperature falls below the set point or exhaust bypasses the oxidizers. The equations for all scrubbers except DS01 through DS07 utilize the emission factors obtained in the performance tests. Since the uncontrolled emission factors for the emission units controlled by DS01 through DS07 are very little, and testing of these dry scrubbers are prohibited by various factors, the Division agrees to use the emission factors provided in Application No. 28321 for the dry scrubbers.

  The facility must sum all the HAP emissions calculated in accordance with all the paragraphs of Condition 7.7 to calculate the facility-wide single and combined HAP emission rates for each calendar month. The facility is required to notify the Division if any single HAP emission equals to or exceeds 0.83 tons during any month or any combined HAP emissions equal to or exceed 2.08 tons during any month.

- Condition 7.8 requires the calculation of HAP emissions for ~~each month and~~ each twelve-month consecutive period. The facility is required to notify the Division if any single HAP emission equals to or exceeds 10 tons during any twelve-month period. The facility is also required to notify the Division if combined HAP emissions equal to or exceed 25 tons during any twelve-month period.
- Conditions 7.9 requires that the facility ~~to~~ use the NOx emission rates for Wet Scrubbers WS03 and WS05 and fuel records to calculate monthly NOx emission rates. The facility must also calculate NOx emissions from the emergency generators and water heaters. The facility is required to combine NOx emissions from all sources and notify the Division if the NOx emissions exceed 2.08 tons during any month.
- Condition 7.10 requires that the facility calculates the facility-wide 12 rolling month total NOx emissions using records obtained in accordance with Condition 7.9. The facility must notify the Division is any 12-month rolling total equals to or exceed 25 tpy.
- Condition 7.11 requires the facility to maintain daily records scrubbant flow rate for Scrubbers WS01 through WS07 and for Scrubbers DAS01 through DAS04 and to notify the Division if two consecutive flow rate readings are below 80% of the average flow rate determined during the most recent performance test.
- Condition 7.12 requires records of the daily temperature readings for the Wet Benches while using texturizer. The facility is required to notify the Division if any bath exceeds 95°C.
- Condition 7.13 requires a log of the pressure drops across the filter for the Laser Ablation stations.
- Condition 7.14 requires record of the daily pH readings for Wet Scrubbers WS01 through WS07.

- Condition 7.15 requires records of the wafer production through the wet benches and a notification if the wafer production exceeds 110% capacity of the amount stated during the performance test.
- Condition 8.2 requires the facility to pay yearly fees.
- Condition 8.3 revokes the previous permit, Permit No. 3672-135-0272-S-030 and any amendments.

Toxic Impact Assessment

The potential emission rate for all HAP/TAP were evaluated to determine if a toxic impact assessment was necessary. All of the pollutants emission rates were evaluated to the MER (minimum emission rate) located in Appendix A for the Georgia Air Toxics Guidelines. A summary of the MER for the pollutants is shown in the table below. The emission rates for arsenic, chromium, diethanolamine and hydrofluoric acid exceeded the MER; therefore, a TIA was required for these pollutants. All of the other pollutants emission rates were below the MER; therefore, a toxic impact assessment was not necessary for these pollutants.

Pollutant	CAS	Emission Rate (lb/yr)	MER (lb/yr)	Modeling Required?
Chlorine	7782-50-5	1,206	174	Yes
Hydrogen Fluoride (HF)	7664-39-3	2,255	284	Yes
Lead Compounds	7439-92-1	29	6	Yes
Hydrogen Chloride (HCl)	7647-01-0	1,948	4,867	No
Isopropanal	67-63-0	19,920	113,547	No
Ammonia (NH3)	7664-41-7	809	24,333	No
Boron Trifluoride (BF3)	7637-07-2	9	4,425	No
Phosphine	7803-51-2	1	73	No
Phosphoric Acid (H3PO4)	7664-38-2	973	2,433	No

SCREEN 3 was used to model emissions from chlorine, hydrogen fluoride and lead compounds. Though the pollutants are emitted from emission points, the single worst-case stack was used to model all the emissions for the pollutants. The following table shows the SCREEN 3 results. Please note that lead compounds do not have any 15-min AAC available. The maximum ground level concentrations were below the acceptable ambient concentrations; therefore, the TIA passed the evaluation.

Pollutant	Averaging Period	AAC ($\mu g/m^3$)	MGLC ($\mu g/m^3$)	Averaging Period	AAC ($\mu g/m^3$)	MGLC ($\mu g/m^3$)
Chlorine	24 hour	3.6	1.08	15-min	300	3.57
Hydrogen Fluoride (HF)	24 hour	5.84	5.68	15-min	245	18.7
Lead Compounds	24 hour	0.12	0.047	15-min	No Data	--

Summary & Recommendations

I recommend issuance of Permit No. 3674-135-0272-S-04-0 to Suniva, Inc. for the operation of a solar panel manufacturing facility. The address of the facility has been updated to 5765 Peachtree Industrial Blvd. in Norcross (Gwinnett County). A public advisory was issued for this application and expired April 15, 2022. The SSCP will responsible for compliance and inspection of this facility. The platform was reviewed for accuracy.